Ordering number: EN 3345

Monolithic Digital IC



No.3345

LB1687

3-Phase Brushless Motor Driver

Applications

The LB1687 is a 3-phase brushless motor driver IC ideally suited for use in VTR capstan motor, drum motor drive applications.

Features and Functions

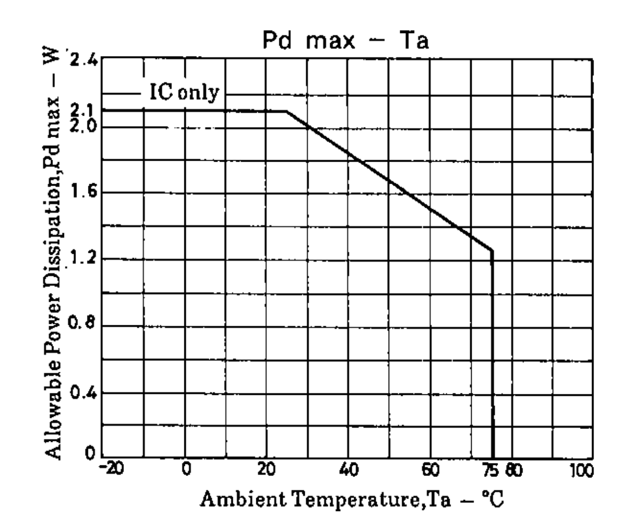
(1) 120° voltage linear type
(2) Soft switching type eliminating noises caused by current switching and making the values of external capacitors smaller (comparable to those of chip capacitors)
(3) On-chip FG amplifier
(4) On-chip thermal shutdown circuit
(5) The FG signal can be used to detect the rotational speed of a motor so that the hall amp gain is changed in two steps, thus reducing torque ripple and noise.
(6) Motor drivable at voltage down to motor supply voltage 5V

Absolute Maximum Ratings at Ta = 25°C

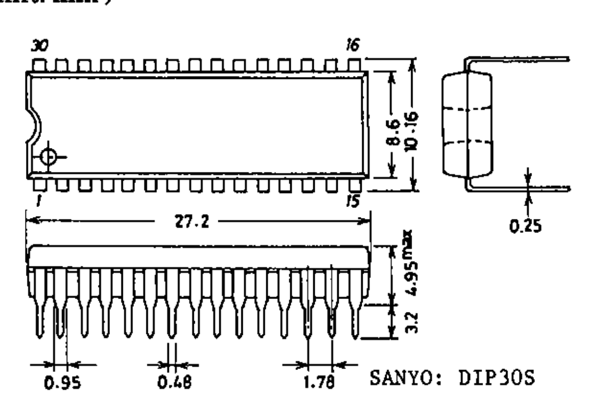
			unit
Maximum Supply Voltage	V_{CC} max1	20	V
	V_{CC} max2	7.0	V
Output Supply Voltage	$V_{OUT.V.W.}$	22	V
Output Current	I_{OUT}	1.5	A
Allowable Power Dissipation	Pd max	2.1	W
Operating Temperature	Topr	−20 to +75	°C
Storage Temperature	Tstg	−55 to +125	°C

Allowable Operating Conditions at Ta = 25°C

			unit
Supply Voltage	$V_{CC}1$	5 to 18	V
	$V_{CC}2$	4.3 to 6.5	V



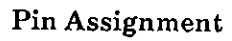
Package Dimensions 3061
(unit: mm)

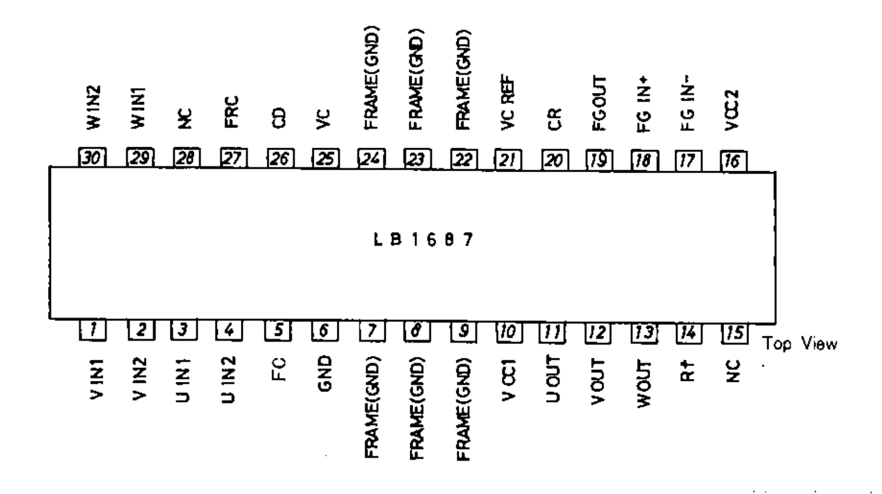


Electrical Characteristics at Ta = 25°C, $V_{CC}1$ = 12V, $V_{CC}2$ = 5V

Parameter	Symbol	Conditions	min	typ	max	unit
[Power Supply]						
Supply Current 1	$I_{CC}1$	$V_C = 0, R_L = \infty$		17	30	mA
Supply Current 2	$I_{CC}2$	$V_C = 0$		6.5	9.5	mA
[Output]						
Output Saturation Voltage	$V_{O(sat)}1$	I_{OUT} = 0.5A, sink + source		1.6	2.2	V
	$V_{O(sat)}2$	I_{OUT} = 1.0A, sink + source		2.0	3.0	V
Output TRS Voltage	$V_{O(sus)}$	I_{OUT} = 20mA (See note.)	20			V
Output Quiescent Voltage	V_{OQ}	$V_C = 0$	5.8	6.1	6.4	V
[Hall Input-Output]						
Hall Amp Input Offset Voltage	V_H offset		−5		+5	mV
Hall Amp Input Bias Current	I_H bias			1	5	μA
Hall Amp Common-Mode Input Voltage Range	V_H ch		1.3		3.7	V
Hall Input-Output Voltage Gain	$G_{VHO}1$			56		dB
	$G_{VHO}2$			43		dB
[Control-Output]						
Control-Output Drive Gain	G_{VCO}		38	41	44	dB
Control-Output CH Difference	ΔG_{VCO}		−2		+2	dB
[FG Amplifier]						
FG Amp Input Offset Voltage	VFG offset		−8		+8	mV
Open-Loop Voltage Gain	G_{VFG}	f = 1kHz		60		dB
Source Output Saturation Voltage	$V_{FG\,OU}$	I_O = 2mA	3.7			V
Sink Output Saturation Voltage	$V_{FG\,OD}$	I_O = −2mA			1.3	V
Common-Mode Signal Rejection Ratio	CHR	(See note.)		80		dB
FG Amp Common-Mode Input Voltage Range	$V_{FG\,CH}$		0		3.5	V
Phase Margin		(See note.)		20		deg.
[Motor Detection]						
Motor Detection Amp Hysteresis Width			35	50	65	mV
CR Pin Threshold Voltage		V_{CR} changes from LOW to HIGH.	2.35	2.5	2.65	V
Thermal Shutdown Temperature	T_{SD}	(See note.)	150	180	210	°C
Thermal Shutdown Hysteresis	ΔT_{SD}	(See note.)		15		°C

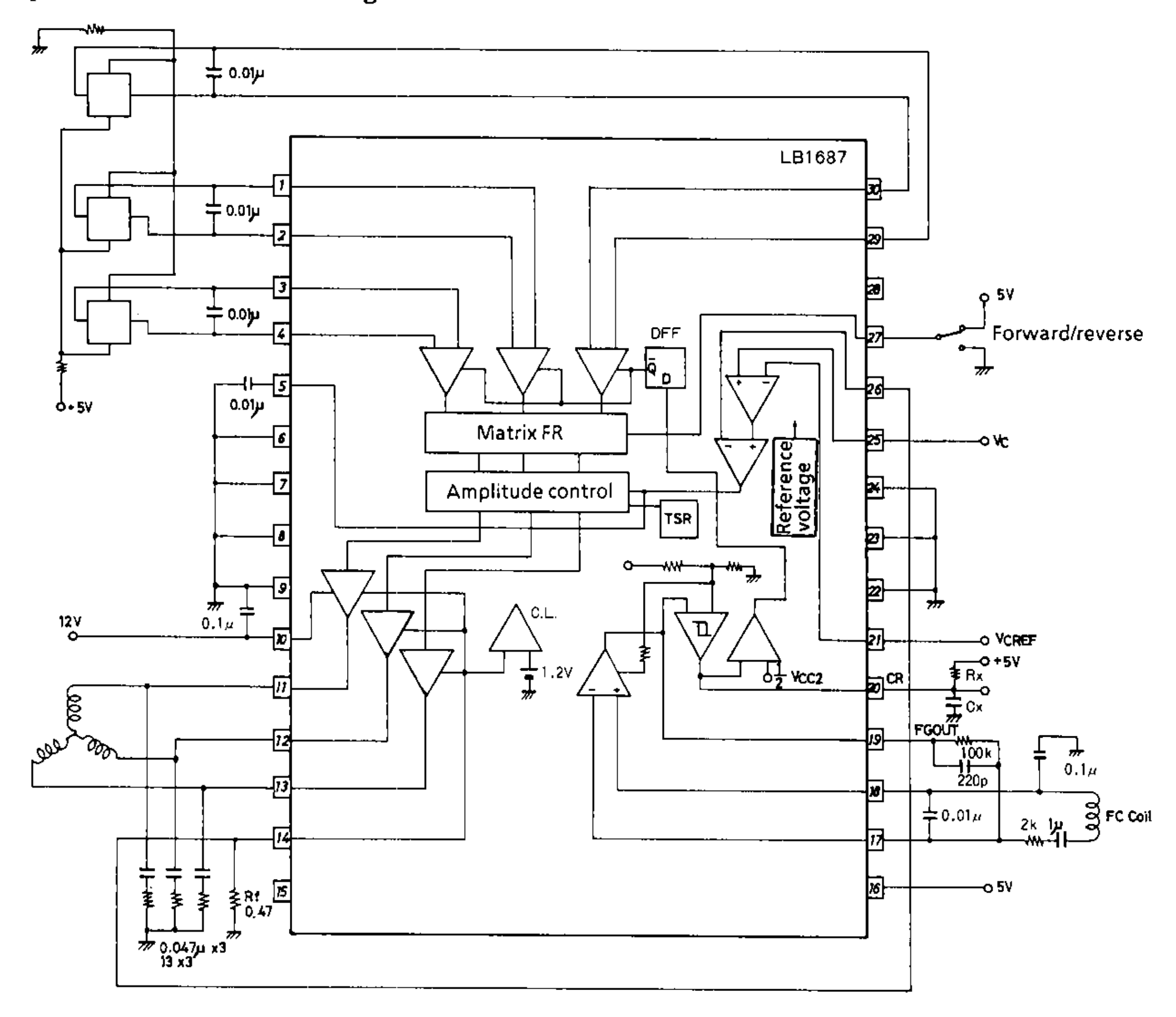
Note : Values shown are design targets only. No measurements have been taken.


Pin Assignment



Equivalent Circuit Block Diagram

Unit (resistance: Ω, capacitance: F)



Truth Table

	Source → Sink		Input U	Input V	Input W	Forward/Reverse Control F/RC
1	W phase	→ V phase	H	H	L	L
	V phase	→ W phase				H
2	W phase	→ U phase	H	L	L	L
	U phase	→ W phase				H
3	V phase	→ W phase	L	L	H	L
	W phase	→ V phase				H
4	U phase	→ V phase	L	H	L	L
	V phase	→ U phase				H
5	V phase	→ U phase	H	L	H	L
	U phase	→ V phase				H
6	U phase	→ W phase	L	H	H	L
	W phase	→ U phase				H

Input:
- H: High level. One of the inputs should have a potential at least 0.2V higher than the other.
- L: Low level. One of the inputs should have a potential at least 0.2V lower than the other.

Forward/reverse control:
- H: 2.0 to $V_{CC}2$
- L: 0 to 0.3V